DOCUMENT RESUME

ED 043 528 SE 010 042

AUTHOR	Roth, Charles E.; And Others
TITLE	Readings in Environmental Awareness.
INSTITUTION	Office of Education (DHEW), Washington, D.C.
PUB DATE	19 May 70
NOTE	68p.
EDRS PRICE	EDRS Price MF-$0.50 HC-$3.50
DESCRIPTORS	Ecology, *Educational Planning, *Environment, *Environmental Education, *Manpower Development, Manpower Needs, Manpower Utilization, Natural Resources, Pollution

ABSTRACT

Presented is a collection of eight short papers designed to supplement "A New Role for American Education." The first four papers relate to man and his environment, and the remaining focus on the needs and developments in Environmental Education. The papers are titled as follows: Man, His Environment, and Human Ecology; Environment and Responsibility; Environmental Quality and Control; Energy and Environment; Local Innovation in Instrumental Technology; Manpower Development and Vocational Education; Environmental Education Through the State Education Agency; A Strategy for Curriculum Development and Implementation in Environmental Education at the Elementary and Secondary Level, Based on Environmental Encounters. A bibliography is included. (PR)

ED043528

OE-X

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

READINGS IN ENVIRONMENTAL AWARENESS

A Selection of Concept Papers

supplementing

A NEW ROLE FOR AMERICAN EDUCATION
May 19, 1970

Office of Education

Department of Health, Education, and Welfare

Washington, D. C. 20202

SE 010 042

CONTENTS

MAN, HIS ENVIRONMENT, AND HUMAN ECOLOGY, by Charles E. Roth.....1

ENVIRONMENT AND RESPONSIBILITY, by Lynton K. Caldwell.....4

ENVIRONMENTAL QUALITY AND CONTROL, by W. D. McElroy.....10

ENERGY AND ENVIRONMENT, by Glenn T. Seaborg.....15

LOCAL INNOVATION IN INSTRUMENTAL TECHNOLOGY, by Frank G. Bouwsma...24

MANPOWER DEVELOPMENT AND VOCATIONAL EDUCATION, by Edward F. Mackin..26

ENVIRONMENTAL EDUCATION THROUGH THE STATE EDUCATION AGENCY
by Richard Kay.....33

A STRATEGY FOR CURRICULUM DEVELOPMENT AND IMPLEMENTATION
IN ENVIRONMENTAL EDUCATION AT THE ELEMENTARY
AND SECONDARY LEVEL, BASED ON ENVIRONMENTAL ENCOUNTERS
by William E. Stapp..39

MAN, HIS ENVIRONMENT, AND HUMAN ECOLOGY

By Charles E. Roth, Director of Education
Hatheway School of Conservation Education
(A Division of the Massachusetts Audubon Society)

Man is an animal--unique to be sure, just as each other species is unique, but an animal none-the-less. He evolved physically and behaviorally over the past few million years from primate stock and was shaped and programmed in response to his interaction with his environment.

Proto-humans, basically omnivorous primates, developed slowly into the species as we know it today, as they exploited the harsher terrestrial habitats within their environment. This push into relatively unoccupied territory may have been in response to population pressures on other niches occupied by other primate relatives. Retarded maturational rate accompanied by continued growth of brain cells, upright posture and adaptation of the throat and larynx are among the physical traits that became identified with man the species and incorporated into his genetic (or first) inheritance.

The enlarged mental capacity, the prolonged youth period for learning, the increased capacity for vocal communication, and the freeing of the forelimbs for manipulative purposes allowed man to vastly expand precultural capacity (which is part of some primate societies) into full culture. Thus through symbolic vocal and manipulative skills, culture was created as man's second inheritance.

As this new species interacted with the environment, using both his genetic and cultural inheritances, he was able to improve his ability to secure his needs and fill his desires from the wealth of resources that he found in any environment. As he became more successful and his numbers grew, man expanded into new habitats, eventually developing capacities to exist in almost every available habitat. The development of abstract concepts, and skills in the manipulation of materials, brought about technology. This, of course, is the ability to maneuver materials in the environment according to predetermined goals.

From the very beginnings of technology, man caused environmental disruptions. Fire for an example, changed, whole associations of plants and animals. As long as human numbers remained small, however, the other elements of the environment with which man was and is interrelated were able to adjust and a dynamic equilibrium was maintained. Where severe environmental disruption by man became localized, man was often forced to abandon the area until the other forces in the ecosystem restored it to a stage suitable for temporary reoccupation.

Man, like all species, exploited the environment to the maximum but was held in check by interactions with other organisms and natural forces. Man's species-specific mental talents have allowed him to devise ways of cheating on the natural system of checks and balances. He controls many of the physical factors that were hazardous to him, such as temperature extremes, moisture and wind. He eliminates dangerous or competing organisms and improves the chances of the survival of his own young.

This is a sound biological impulse since all species press for survival and expansion of their kind. However, resources of "Spaceship Earth" are finite and, as a species, man overcrops the Earth's resources and threatens his own survival. This occurs in essentially one of two ways: exhaustion of resources necessary to support a population, and/or fouling of the basic resources by toxic wastes. Therefore, the very sound biological impulse to reproduce ones kind can lead to destruction when pursued to excess.

The human animal is already expanding in numbers and developing and aggregating habits to the point where there are very few places left for him to transfer his activities while other areas recover. His exploitive and consumptive life styles have produced waste accumulations in many areas, particularly in the highly developed countries, that pose a serious threat to his continued existence in those localities (at least in any style that allows for reasonable development of the human potential).

No species is exempt from extinction or evolution into a new form more closely attuned to current ecosystem realities. No species stops population growth at optimum level. Man alone has the capacity to do this, if not the will.

Man's choice is to grow explosively and exploit resources and create excessive wastes until extinction occurs (not only for man but many other species as well) or regulate population levels around an optimum level and develop life styles that will permit each person currently alive reasonable opportunity to achieve his maximum human potential and assure continuation of the species well into future time.

It is the purpose of environmental/ecological education to help people acquire the requisite ecological concepts and cultural tools to devise and live according to a life style that is ecologically sound and humanly successful, to assure man a continued and successful existence on this planet.

Every thing we do (our work, recreation, and procreation) has environmental/ecological consequences and consequences for human fullfillment. Understanding these changes that are needed in interactions and inter-relationship with the environment, to bring about a reversal of current negative actions for achievement of the best world possible for all life, is the goal of environmental/ecological education.

###

ENVIRONMENT AND RESPONSIBILITY

By Lynton K. Caldwell, Professor of Political Science
University of Indiana, Bloomington, Indiana[1]

Implications for the Future

The Spaceship Earth metaphor in relation to human responsibility may be summarized by the following remarks of Buckminster Fuller:[2]

> Spaceship Earth was so extraordinarily well invented and designed that to our knowledge humans have been on board it for two million years not even knowing that they were on board a ship.
>
> OOO
>
> It is therefore paradoxical but strategically explicable -- that up to now we have been mis-using, abusing, and polluting this extraordinary system for successfully regenerating all life aboard our plantetary spaceship.
>
> OOO
>
> The designed omission of the instruction book on how to operate and maintain Spaceship Earth and its complex life-supporting and regenerating systems has forced man to discover just what his most important forward capabilities are.

Modern man has not lost his capacity for savage behavior, but he can no longer be an innocent or an ignorant savage.

---

[1] Excerpted and reproduced with permission of Dr. Caldwell, from his remarks: "The Coming Polity of Spaceship Earth," at the Symposium on Man and His New Life Environment, St. John's University, April 20-21, 1970, pages 11-17 of official text.

[2] R. Buckminster Fuller. Operating Manual for Spaceship Earth, Southern Illinois University Press, Carbondale, Illinois. 1969.

He now knows that he and others like him are passengers on a spaceship and that this natural mechanism is finite; that its finely balanced relationships are the perishable results of millenial evolution. Although some men (even in antiquity) have been aware of the importance of environmental relationships, only contemporary man has begun to understand the full significance of these relationships. Ecology is a very young science, and yet enough has been learned about man-environment relationships and the life-support systems of Spaceship Earth to avoid repetition of the worst ecological errors of the past. Enough is now known to permit prudent judgments regarding future demands upon the environment. But while man can now write an operating manual for Spaceship Earth, it is not yet evident that the ability to write it implies the capability to use it.

Awareness of man's environment crisis is as yet very unevenly distributed throughout modern society. Understanding of the causes of the crisis and of its implications for human behavior are even more limited. Environmental quality and the Spaceship Earth metaphor have been concepts of a sophisticated elite. They are now spreading more broadly over the social spectrum of the more highly literate techno-scientific societies. Nevertheless, the dominant economic and judicial concepts and public institutions are based upon the perceptions of a pre-spaceship age. These traditional concepts are now under challenge in many parts of the world and especially in the United States and Northwestern Europe. While there is substantial evidence of popular support for environmental quality legislation and its more agressive implementation by government, there are also indications that many of the individuals heading the institutional structures of modern society do not regard ecological or environmental issues as critical. At least in the United States, an attitude survey of "leaders" in Northeastern metropolitan centers indicated that environmental quality was a "low priority" issue.[3]

It might be argued that the esthetic and ecological condition of the American megalopoli tends to corroborate this attitude. The appearance of most American cities suggests that they have been dominated or governed by men to whom the quality of the environment was unimportant. And

---

3 Eastern Leadership and Environmental Quality Study sponsored by Resources for the Future, 1969.

one might plausibly suppose that leaders who believed that these cities were satisfactory habitats for man would not be impressed by talk of Spaceship Earth. The structure of leadership for environmental quality and that for economic-industrial activities are largely populated by distinctly different sets of individuals. There are persons who can be identified in both structures. But the industrialist or developer who professes sympathy for the environmental quality movement will be suspected of joining the effort in order to contain or control it, or to identify with it superficially as a "good citizen" public relations gesture.

It would be logical for the leadership of the established order of agriculture, banking, manufacturing, merchandizing, real estate development, and labor organization to be unsympathetic to the political-economy implied by the concept of Spaceship Earth. To critize the institutions that brought about the degradation of the environment is to criticize the men who presided over those institutions. Men of small ego seldom rise to positions of control in bureaucratic or corporate power structures. The controlling leadership may be assumed to regard itself highly and is not likely to be dissatisfied with the structures of value or organization through which it moved to the top. To critics of the prevailing politico-economic structure the men at the top might modestly declaim: "What's wrong with the system? Look who's in charge.. A system that puts us in charge must be a pretty good system."

Men of this persuasion are not likely to listen patiently to arguments for a totally new type of political economy. It is easier to dismiss Spaceship Earth as academic nonsense than to concede that the metaphor is a practical model of reality. To concede the practicality is to invite serious consideration of transforming the economy. There are obvious risks in this course of action, and the risks are both personal and institutional. In the transition from an open system economy to a closed system economy; whole industries, and industrial and domestic behavior patterns would be changed. The types of personality andoperational skills that made for success in what Kenneth Boulding has called the "cowboy economy" would not necessarily serve for leadership in the polity of Spaceship Earth. And so there is a crisis of leadership closely involved with the environmental crisis, as well as with the question whether there is <u>in fact</u> an environmental crisis.

While there may not be agreement on the extent and degrees of a crisis, there are undeniable critical situations. None seriously contend that the Santa Barbara or Torrey Canyon oil spills were insignificant; that the pesticide fish kills in the Mississippi River and the Rhine were unimportant, or that smog damage in Los Angeles or Mexico City is imaginery. But the particular significance one attaches to these events could make a difference in how one believes they should be handled. If one views them as unfortunate accidents in a normal course of events, he may favor ad hoc and limited remedies. If he sees them as inevitable consequences of a careless use of technology or an irresponsible organization of the decision-making process, he may propose reforming or institutionalizing solutions.

From the "unfortunate accident" viewpoint, the problem is to clean up the specific damage at hand and to prevent its recurrence. No general conclusions or comprehensive policies are likely to result from this view of events. From the "inevitable consequence" viewpoint, a radical solution designed to prevent similar future cases is seen as the only adequate answer to the problem. Reforming answers might include banning off-shore drilling for oil and adopting rigorous controls for overseas shipment of oil; banning internal combustion engines from central cities, and prohibiting the manufacture and use of certain pesticides. The "unfortunate accident" viewpoint sees a need only for incremental adjustments within the techno-economic system; the "inevitable consequence" viewpoint sees the flaw in the system itself and seeks a fundamental systems change.

Of these two viewpoints only the second is consistent with the ideology of Spaceship Earth. The first attitude represents the traditional, conventional, incremental, and allegedly practical way of dealing with the environment. But if the systems viewpoint is correct; the incremental approach cannot be relied upon to remove the causes of ecological disasters, nor to prevent their recurrence. The reason for this is that the conservative course of action will rarely get to the root of the problem. It will always stop short of a solution that is inconsistent with the prevailing assumptions about economic and political feasibility.

If the foregoing reasoning is valid; it follows that men who view the world as most men have been accustomed to viewing it throughout historic time, can hardly be expected to function as the engineers, managers, and captains of a polity of Spaceship

Earth. Their logic, their economics, their sense of timing, and even their ethics are all wrong in relation to the task. As leaders in government, business, labor, and education; they may, within their frame of reference, sincerely endeavor to cope with society's worsening ecological circumstances. But they will not succeed.

There is an unreality -- a quality of fiction -- that characterizes the many reports and recommendations on public policy for the environment. Although certain limited objectives have been realized, the greater volume of official and scientific recommendations will not be implemented unless a massive change of public assumptions and priorities occurs. The outpouring of writings protesting environmental degradation and predicting ecological disaster leads easily to the belief that the ecological crisis, having been identified, is being effectively attacked. And while reflective consideration would correct the error, highly literate people fall easily into the assumption that what "everybody" is reading and talking about is what most people actually believe. But in fact, the great mass of the world's producers and consumers continue their habitual behaviors devoid of any ecological ethic or awareness. The extent of public readiness to accept a Spaceship Earth economy is presently unknown and could not easily be ascertained. Public opinion on environment related issues does appear to be changing and it could be highly conjectural to predict what it may be in any given country at the end of the present decade.[4]

This should suggest that it will be difficult to shape a polity for Spaceship Earth in the absence of a reinforcing politics. The failure of our present hopes to win more than token realization is largely attributable to this discontinuity between polity and politics. We cannot achieve the magnitude of public commitment that environmental quality requires without public acceptance of the basic tenants of the Spaceship

---

[4] But a Gallup poll commissioned by the National Wildlife Federation for the 33rd. Annual Meeting (1969) indicated that American public opinion favored stronger environmental quality measures even if increased taxation were entailed. A report on the poll by Robwrt Cahn of the Christian Science Monitor was reprinted in the Congressional Record (March 12, 1969), pp. E 1904-5.

Earth philosophy. And this philosophy cannot find practical expression unless and until it is related to a plan of political action. The present convential, growth-oriented attitudes of large numbers of Americans (and perhaps of most people) are counter-functional to any effective effort to bring man's behavior toward the biosphere under ecologically oriented control.

ENVIRONMENTAL QUALITY AND CONTROL

By Dr. W. D. McElroy, Director
National Science Foundation [1]

It's trite to say we live in momentous times. And yet it's perfectly true. The times are out of joint. Crisis upon crisis is brought screamingly to our attention with increasing frequency. Some of us can absorb no more and tune out. A few react with blind violence. The majority of us are bewildered and frustrated, determined to do the right thing but somehow feeling ineffective or not quite certain. What <u>can</u> a man do?

I'm an optimist by nature. I believe you and I are witnessing, as Glenn Seaborg put it, the birthpangs of a new era." In my view, the stresses and strains we see all around us are but outward manifestations of this phenomenon. The substance, it seems to me, is a basic change in our concept of man. In a way, we are experiencing a fundamental change in ideas somewhat similar to those of Galileo, when man's view of himself in relation to the universe changed drastically. Today we see ourselves the center, the master, the beneficiary of the earth's riches. Tomorrow this concept must change radically. Man will develop, I believe, a new harmony with nature in a relationship ensuring his fullest development consistent with the continuation of the species. Oversimplified, I believe mankind must radically readjust his concept of living within his environment. Man is said to have the divine spark, but that spark may no longer be used to justify his exploitation of our planet. I have put the idea crudely, but I predict the ramifications of this idea will cause us to evolve a new society, complete with new institutions. The revolution of the idea, I remind you, is the firmest, most lasting type of revolution.

---

[1] From remarks of Dr. McElroy at the University of Houston Commencement, Houston, Texas. May 30, 1970, pages 1-8 of official text.

One cause for my optimism is simple, perhaps simplistic: we have no choice. The real issue is how we're going to change our society and our institutions in the most intelligent manner.

I say there is no choice because the ultimate alternative is the extinction of man as we understand the term today. This is no exaggeration, although the enormity is such that so often we have difficulty comprehending the ramifications.

Of course the crisis, the crisis of crises, is real. We all know the familiar litany of the population story, but have you ever examined the implications of some of the more common crises? Consider the solid waste problem. I'm told that solid waste in the United States comes from four principal sources: one billion pounds a day from private households, six billion pounds a day from mining and resource exploitation, twelve billion pounds a day from agricultural sources - and only seven hundred million pounds from industry.

Even the atmosphere is polluted with wastes, so much so that measurable changes in the climate of the Northern Hemisphere have taken place. In Washington, D.C., for example, solar radiation at ground level has decreased by 20 percent since 1910. Ecological effects are unknown, but the changes in solar radiation are the direct result of particulate matter in the atmosphere.

One can cite other crises. But even the word crisis has been used so frequently that somehow it seems to have lost its meaning. With all this stress - all fairly well documented I might add - is it any wonder the Nation's young have a widespread dissatisfaction with the quality of our life? If there are those here today who doubt there is dissatisfaction or that it is widespread, I suggest you read the recent report of the twenty-two Republican Congressmen who toured fifty college campuses last year.

And can't we older people understand the young's dissatisfaction? Can't we understand them when they say in effect: It was supposed to be better than this. Isn't there something better to chose from? Is Peggy Lee right when she sings of the hollowness of life?

I don't think so. I believe there <u>is</u> something better to choose from, provided we have the leadership and initiative to develop a better selection of choices on how we live and the wisdom to choose well. Let me explain.

It is a mistake and a dangerous oversimplification to think that the environmental problems we face are totally the result of unprincipled, evil men. In a large sense, Pogo's simple truth is most appropriate: "We have met the enemy and they are us." Then, too, much of what we do is the result of deeply held perspectives grounded in our religious background. It is a fundamental tenet of Western theology that man is made in the image of God, who planned the earth for man's use and benefit. This religious perspective was amplified in America, where a virgin land provided an outlet to the fullest exercise of individual freedom and use of the environment. During our early history there were few conflicts between our beliefs, our aspirations, and the environment. Smoke, stumps, and slag heaps testified to our developing world and were the marks of progress. In the vastness of our developing frontier, there was neither time nor incentive to worry about the longer-range results of our activities.

These attitudes are only now being questioned more widely. To change them will take time and greater popular understanding; that's why Earth Day was so important. Skeptics question the value of Earth Day, pointing out its superficial aspects. I disagree for I hold it to be a valuable first step in rallying popular interest. Now that interest should be exploited through systematic study and research - and the University of Houston is beginning just that. In the last analysis, what we think will determine what we do.

Even when we succeed in reorienting our attitudes - actually a new philosophy - there remains the many practical problems of reorienting our ways of interacting with the environment. And we face formidable obstacles. Consider specialization. Enormous progress has been made by breaking down problems and scholarly fields into ever smaller compartments. As we came to know more and more about less and less, the number of branches of human learning multiplied. Yet if there is anything we've learned about environmental problems, it is that they must be approached on a comprehensive, coordinated basis.

Consider how our economic system fosters decentralized decisionmaking. Each individual acting rationally seeks to maximize his gain, within a system which returns the full benefits of investment to the individual, but shares the social costs with all. Inevitably, in certain areas, this brings ruination, what Garrett Hardin has aptly called "the tragedy of the Commons."

When I was a boy on a farm in Bell County, we lived by the old-fashioned idea of helping your neighbors - whether in harvesting crops or in herding cattle. In small communities this was typical, but with urbanization, we have lost most of that zeal. Now, in the words of Andrew Hacker, "the United States lacks the basic requisites ... for developing community life either in this generation or in the several to follow." Professor Hacker argues that Americans are too self-centered, too preoccupied with a program for personal success, to make the kinds of sacrifices that will help his fellow man.

To complicate the problem still further, many of our institutional structures are ill suited to the solutions of man's needs. Whatever our particular focus may be, we find that environmental problems invariably extend beyond the narrow confines of the jurisdiction at hand - and may even be international in scope. But the trend to ever broader solutions to environmental problems runs contrary to our current desire for localism and political decentralization. On the one hand, we say that when the government is close to the people, public decisions are better. On the other hand, the scale of environmental problems often requires knowledge, institutional mechanisms, and authority only to be found at higher levels of government and organization. How are these fundamental opposite trends to be made compatible? Or examine the issue of individualism. To solve some environmental problems our society may well have to restrict some aspects of an individual's presently perceived freedom.

Like the vast majority of Americans, I condemn as naive and dangerously irresponsible the argument that we must have revolution, with blood in the streets, to change American society. The changes will come through existing institutions. We will still have universities, we will still have our political institutions, we will still have corporations, but all of these will be increasingly different from what they have been in the past.

With such formidable change in the offing, what is the citizen, the new graduate to do? We often define the purpose of college education as the development of a set of competencies which includes a broad body of knowledge and the ability to communicate, collaborate, and to fulfill a resonsible social-role. But, in its essence, it is more than that. In the words of one of the world's foremost psychologists, "The principal goal of education is to create men who are capable of doing new things, not simply of repeating what other generations have done - men who are creative, inventive, and discoverers.

The second goal of education is to form minds which can be critical, can verify, and not accept everything they are offered."

Some of the student unrest we see about us, by these criteria represents a distant success rather than a failure of our educational system. But if the full purpose of your university education is achieved, you will be willing to lead and participate in the broad social changes our future demands.

ENERGY AND ENVIRONMENT

By Dr. Glenn T. Seaborg, Chairman
U.S. Atomic Energy Commission[1]

Let me turn now to a different way that we must reevaluate our use of energy. And this has to do with this whole complex subject of conservation and environment that is weighing so heavily on so many people's minds these days.

The material affluence that our technology and abundant use of energy has created in this country is also generating some negative feedback about the use of our resources and the relationship to the quality of our environment. Based on what we can see going on about us, on what we are learning from various specialists at work now and others making projections of the future, we are becoming alarmed about the limitations of natural resources and our ability to deal with our wastes.[2]

ooo

Ultimately it is going to be very large amounts of very cheap energy, used in conjunction with highly systematized technologies, that will move us from a wasteful and polluted world to a more efficient and healthier one. Also, the major source of this energy is going to have to be, sooner or later, nuclear energy - including the energy of fission from breeder reactors and hopefully someday of fusion from thermonuclear reactors.[3]

ooo

---

1 Excerpts from addresses of Dr. Seaborg, as indicated in these notes, and used with permission of the author.

2 Remarks before the National Electrical Manufacturers Association, Chicago, Illinois, November 11, 1969, page 10 of official text.

3 Ibid., Page 12.

This abundant cheap energy, which only the atom will be able to supply for centuries to come, will allow us to recycle our natural resources and preserve our environment. The relatively small amount of waste that nuclear plants will produce can and will be successfully managed. It will not pose the awesome burden that some alarmists today claim it will. With proper site planning and the wise application of existing and new technologies the thermal effects of nuclear plants can also be handled well - perhaps even to man's advantage. One has only to compare in a calm and rational way the small risks involved in the judicious use of nuclear energy with the enormous consequences of moving the modern world ahead only on fossil fuels to realize that it would be sheer folly not to pursue the fullest development of the breeder reactor and to continue to work for a breakthrough that will lead to our ability to use controlled fusion.

The nucleus of the atom will prove our most beneficial and humane source of energy if we work hard at the task of using it beneficially and humanely.[4]

OOO

One subject that I can only touch on this evening but which is going to be widely debated in the days ahead is, how much power do we really need? And this boils down further to a question of the relationship of our energy level to our standard of living. As I indicated before, there is a school of opinion among today's environmentalists which sees our high standard of living as a major villain, and those of this school often make their case by showing the per capita consumption of resources and expenditure of energy of a U.S. citizen and comparing them with those of a citizen of a lesser developed country. Naturally, the contrast is startling.[5]

OOO

Finally, I think the growth of nuclear power will play a significant role in giving us more power with less environmental pollution. And I would like to elaborate briefly on this subject since it is one of major interest to this audience.

---

[4] Ibid., Page 16.

[5] Remarks before the Ninth Annual Meeting of the Southern Interstate Nuclear Board, Lake Eufaula, Oklahoma, April 20, 1970. Page 6 of official text.

As I am sure you know, the growth of nuclear power, which has taken hold economically only in recent years, has come under fire recently on environmental grounds. Some of our critics tell us, as if to assuage our unhappiness, that we should not take it too personally, that nuclear power is just one of many forces caught in this historic period of environmental concern. Some of the same critics also admit that in their assaults on nuclear power they are resorting to a bit of "overkill" to drive home their points - particularly to the public. Certainly it is regrettable that both these conditions exist. But I somehow feel they will not turn out to be all bad. Much of the environmental controversy now raging will have a positive effect on the growth of nuclear power, which I believe, when the smoke clears, will come out better than ever. As I indicated before, we must and we will solve the problems involved with thermal effects of all steam generating plants. A variety of solutions already exists. It is mainly a question of bringing them and new alternatives - including ways to put the waste heat to beneficial use - before the public and making clear what considerations and costs are involved in balancing their need for electricity with their need for a healthy environment. [6]

000

The most important basis for the desirability of nuclear power plants must be in their comparison with other methods of generating electricity - primarily coal, since it is the chief competitor of nuclear power. In such a comparison there can be no doubt that nuclear power comes out looking like Mr. Clean. One has only to examine the statistics on air pollution to realize the advantages of a fission plant over a fossil fueled one. The estimated annual cost of the adverse effects of air pollution in the U.S. is now about $15 billion. And this does not include the human costs of illness and death resulting from respiratory ailments such as lung cancer and emphysema. A major factor in such air pollution is the sulfur dioxide released from fossil-fueled plants. Such plants are responsible for about three-quarters of the 35 million tons of SO_2 now released annually in the U.S. - and this figure may well rise to about 95 million tons annually by 1990. Fortunately, a shift toward nuclear power will help to alleviate this problem as well as those associated with other combustion products.

---

[6] Ibid., Page 9.

Of course there are a number of other environmental advantages of nuclear power - the more aesthetic appearance of the plant, the absence of the traffic, noise and eyesores associated with the hauling, dumping and storage of coal and the removal of ash. I know you are familiar with these comparisons so I am not going to take time to review them in detail. But all this leads me to believe that in the final analysis nuclear power is going to make a major contribution toward out efforts to balance our needs for energy with those for a healthy environment.[7]

OOO

There is another aspect of the future and "futurism" which I think is important, and that is that our interest in it and concern over it today should be taken as a sign of optimism. This may be hard to believe in view of all the despair that seems to abound. I sometimes get the feeling that much of this despair is superficial because our problems are made so visible and urgent today through our mass media. But underlying this, and inherent in today's activism, is the feeling that we can do something about the future and that perhaps we will emerge from many of our current crises far better men in a much better world. If this were not true I do not think most of us would bother attending this conference or any other for that matter. We might instead be out "living it up," having a last fling in this affluent society that so many see as a fool's paradise.

Of course, there are those who <u>are</u> trying to escape - chemically and culturally - from the harsh realities and responsibilities of these paradoxical times. But most of us are facing the future and, as the expression goes, "trying to get a handle on it." In view of all this let me give you some personal thoughts on energy and the future, the subject you have asked me to discuss today.

There is no doubt that energy - how much of it we have and the ways we use it - will have a significant effect on that future. Opinions on the extent of that effect vary greatly.

---

[7] Ibid., Pages 10-11.

There are some who see the cooperative use of vast amounts of energy - energy supplying unlimited power across national borders, raising living standards, lowering production costs, helping to distribute water and produce food - who see all this as a prime source of achieving a new era of peace and progress in the world. There are others who see abundant energy as having only a marginal effect in promoting human progress. And there are still others who see the future use of more energy as devastating to man and the whole planet. I think my own position within this range of opinion will be clear by the end of my talk.[8]

ooo

Now having reviewed quite briefly the status of the energy sources at our command and some of the problems involved in applying them, let me spend a few moments discussing some of the future implications associated with them. And what follow are some of my own reflections on this matter and not necessarily the thinking or policies of my agency or the U.S.

First, let me offer a rather broad thought with which I think many of you will agree. In view of both the longer-term energy resource problem we face and the shorter-term environmental crises due to the misuse of such resources, it seems to me that the time has come - or perhaps is overdue - when men, nations and the entire international community must begin more serious energy policy planning. If we are not to thoroughly deplete many of our irreplaceable natural resources in a matter of a few generations, and at the same time put those generations in environmental jeopardy by the misuse of those resources, we must begin to use those resources in a highly rational way. I am not about to elaborate on or even suggest any master plan for the international or even North American development and use of energy resources. But I seriously believe that we must no longer allow our energy use to be determined by purely short-term economic consideration, particularly by the competition between fuel resources.

---

[8] Remarks before a Joint Conference of the Chemical Institute of Canada and the American Chemical Society, Toronto, Canada Mary May 25, 1970, page 2 of official text.

There are signs that our environmental crises are beginning to force us to a more rational use of energy. One aspect of this has been the increasing interest in the proper siting of power plants in the U.S.. I believe we are bound to see in the near future an approach to the regional, national and perhaps international planning of power plant siting that will consider several factors. These will include environmental effects such as thermal effects on water systems, air pollution problems as determined by regional atmospheric conditions and population densities, the management of radioactive effluents, the need for better management of land and wildlife and recreational resources, aesthetic considerations and many other factors that are not now central considerations in the siting of power plants, not to mention the planning of more imaginative energy systems.[9]

ooo

To put it quite frankly, many people today - because of the focus on environment - have turned on energy as a major villain of our time. Whereas only a few years ago its labor-saving, life-saving and mind-stimulating attributes were praised, today energy, and particularly the idea of its continued growth, are viewed as threats. Our ability to release and apply massive amounts of energy is seen as a first cause in the ultimate destruction of the earth. Whether it is the potential destruction of nuclear weapons, the air pollution of combustion, the thermal effects of power generation, the radioactive effluents of nuclear power plants, the waste produced by industry, the indiscriminate scraping of a bulldozer or the noise of a jet, many people are pointing the finger at energy, or more precisely our command and release of it, as the real culprit. I think most of us know that to make energy as such the scapegoat for man's indiscretions, excesses, or just stupidity, is quite naive. It is much the same as saying that if we did not have food we would not have indigestion.

Nevertheless we must view seriously the effects and side-effects of energy and its potential growth today. And there is no doubt that the environmental focus has made us take a harder and more critical look at energy growth and its implications. The recognition of population growth, the per capita

---

[9] Ibid., page 11.

growth of goods and services and their by-product waste and pollution has forced us to think in terms of limits,controls, stability and more generally what has been termed "the quality of life". [10]

OOO

I want to talk about what I call "The New Alchemy," and I refer to it as "alchemy" not because I believe it to be a process of mysterious change or a foolish, unrealistic undertaking, but rather because it involves transmutations that I am sure most of today's public believe would be miraculous.

The major efforts of the ancient alchemists were concerned with such things as turning baser metals into gold and discovering the elixir of youth. The New Alchemy will be far more difficult. It will call for physically and spiritually building a new world and a new mankind. It will require the construction of more human shelters in the next three decades than were constructed in all previous human history. It will demand the care and feeding of double the number of people on earth today. It will involve turning waste back into precious resources and turning wastelands (natural and human) back into viable and liveable environments. And, rather than calling for the discovery of the elixir of youth, it will require the discovery of new ways to revitalize our society by mixing the most creative and productive elements of youth (some having a short half-life) with those older, stable elements of the society that have proved their worth over long periods of time.

If my New Alchemy seems like quite an undertaking, let me assure you <u>it is</u>. There is no single formula, there is no one catalyst, that will successfully bring together all the necessary ingredients and transmute them into the "miracle product" of a perfect physical environment and a perfect human society. The entire process is more of an evolutionary one and the final product the result of the synergistic effect of the best forces of science and technology and of individuals and society being brought together at the right time in the right way.[11]

OOO

---

[10] Ibid., page 13.

[11] Remarks before the 98th Annual Meeting of the Manufacturing Chemists Association, The Greenbrier, White Sulpher Springs, West Virginia, June 4, 1970, page 2 of the official text.

What might some of those lessons be and how might we respond to them? I will mention only a few.

The first that comes to mind is that in our enthusiasm for science and technology in recent years we may have oversold our physical powers and undersold those of human resources. There are several implications in this. We have raised a generation of youth whom we have convinced we have an industrial-technological fountainhead that can supply all the world's needs and gratify all human desires. But we have failed to stress to that generation (or perhaps learn fully ourselves) what a critically tuned system that fountainhead is and how it can only be maintained and its output increased and improved by human work and creativity. That work and creativity must be theirs. The young must learn not only to understand and operate the industrial-technological system, they must gain the knowledge to improve it immensely - particularly to fulfill the higher human ideals and values they wish to foster.

It will do little good to go back and recite the past accomplishments of scientific, technological and industrial society to win over youth and the advocates of our increasingly participatory democracy. They are more apt to inquire "What have you done for me lately?" and even more important than that, "What do you plan to do now?". To answer this latter question we must do more than tell them or even show them. We must involve them. And I think that all of you in private industry are coming to realize that "the business of business" is now concerned with such involvement. It must share with our educational system and our government the responsibility for creating a new breed of citizen.

All this means that we are faced with a staggering task in education and public communication in the days ahead. For to share more fully and effectively in the work and planning of the extremely complex social and physical system we must create today a "participating citizen" who will have to become something of a "super-citizen," one who has been educated, in the fullest sense of the word, to understand and evaluate today's facts of life and the web of complexities into which they have been woven. This is a far cry from what industry thinks of today as merely "the consumer". [12]

OOO

---

[12] Ibid., page 4.

The increased interplay between science and society will also have another effect that may represent a hidden human breakthrough, if we might use that expression. That breakthrough would be in the form of a whole new level of human thinking in which the rational processes that have been at the root of science and technology and the heightened human commitment we see rising throughout so much of the world today are merged. In other words, the two cultures - science and humanism - will tend to become one. This does not mean that all artists will be capable of programming a computer or most chemists able to play the cello. It does mean that we may see the rise of a new Renaissance Man (and Woman) capable of both great reason and sensitivity, able to feel as deeply and intensely as he can think incisively and broadly.

Such thinking and feeling will no doubt see us effect vast physical and social changes in our world. A world that merges and maximizes the best brainpower with the power of highest human values would minimize, and eventually eliminate, human conflict. It would be able to channel aggressive and competitive instincts to some useful, productive activity. The major preoccupation of this type of world and humanity would be in stimulating the growth of human creativity within a balanced natural system on this earth. The conservation of natural resources and a healthy natural ecology would be maintained through both a controlled population size and an industrial and agricultural system that is integrated and guided by a recycle philosophy. Human resources would be nurtured most carefully in a world where there are no unwanted children or people deprived of dignity. Aesthetic considerations would take high value in all human enterprises and the natural and human landscape would often blend as one, while the people who inhabited them would flourish on such landscapes as individuals.[13]

###

---

[13] Ibid., page 10.

LOCAL INNOVATION IN INSTRUCTIONAL TECHNOLOGY

By Frank G. Bouwsma, Vice President, Instructional Materials
Miami-Dade Junior College, Miami, Florida

Most innovations which use instructional technology and are considered successful according to utilization three years after initiation are largely the result of faculty and department chairmen or principals who have been personally involved in the development of the program from the beginning. Local innovation will flourish if there is a systematic effort to bring ideas to the faculty and staff. It is also necessary for local change of project concepts to fit local needs or local resources, and idea development should support such localizing for personal involvement.

Sophisticated technological innovations which are at the present state of the art of engineering but are beyond the present state of the art of teacher-learner control will not be as effective as simple low-cost systems which are upgraded in stages of sophistication to meet teacher and student needs.

In all instructional technology developments the need for the software and its use should be predicted in terms of numbers of use and learning effect. When the first increments are funded the programs must be evaluated in relation to the prediction and these evaluations should be made known immediately to other institutions involved in similar projects. All hardware purchases should also have alternate uses described before funding is permitted.

Local innovation will be encouraged most in a regional framework of change, where project institutions will develop materials and technological innovations on a regional consortium basis.

Regional leadership in instructional technology must be assumed by some project institutions and they must develop faculty and staff training projects which will encourage others to attempt valid alternative approaches to learning. Peer influence on institutions is a major program to be developed within existing educational frameworks.

Certain technological advances which are proposed to help solve the problem of faculty development and rapid information dissemination should be established quickly to get a system of ideas in operation with the key project institutions. These technological improvements should also be put into operation to bring about the accountability system which will then establish greater local option within the communities. In this category are projects for research systems disseminated by teletype interchange, a management information system for accountability, a videotape interchange network of faculty ideas, a microteaching series of regional workshops, a library of microteaching videotapes, and common program materials development by schools and colleges in regions for multimedia approaches to student learning.

There are many critical equipment and materials interfaces which will have to be devised between regional centers and project institutions and common interchange.

###

MANPOWER DEVELOPMENT AND VOCATIONAL EDUCATION

by

Edward F. Mackin

May 15, 1970

MANPOWER DEVELOPMENT AND VOCATIONAL EDUCATION

The publics sudden concern about the quality of the environment is beginning to fucus on what can be done to halt pollution, conserve resources and extend health services. The Administration has called for an expenditure of 10 billion dollars for the 1970's in the Nation's battle for the environment. Most of these funds will go into construction and other forms of physical capital. If we are to utilize effectively these new facilities, we must make the decision now to invest in the training of people who will not only operate new plants but who are also capable of working efficiently across the entire field of environmental management.

The problem will not come about in the near future, it has already arrived. Numerous plants, facilities, laboratories, and research stations are presently understaffed and the situation continues to worsen. While treating the root cause of environmental pollution will require much more then developing technical manpower, it is a good place to start if we are to begin to repair environmental damage and check major sources of pollution. There is clearly a need for many thousands of well-trained persons to work in all of the branches of environmental management and particularly at the technician level. But calling for a crash program across the country without a carefully thought-out plan of action will certainly exacerbate an already confused and complex problem. What is needed is a carefully prepared short-and long-range plan that examines the manpower need in qualitative and quantitative terms as well as evaluating present and required sources of supply.

There is a second facet to the problem. In addition to the growing need and the inadequate source of supply, there is evidence of growing confustion as to the kinds of technical personnel in greatest demand and who should be responsible for their training. There is no single agency with clear authority for developing environmental manpower at the Federal level. Perhaps there shouldn't be. But there is certainly a need for coordination of the efforts in this critical field. Not to coordinate is to risk a serious duplication of resources and we have too few resources to waste.

A third aspect of the environmental manpower problem concerns the experience, training and educational requirements for employment in this rapidly emerging career field. This is particularly so for technical and key support personnel. Manpower development programs for environmental management and pollution control technicians requires a <u>fundamental change</u> in the philosphy, organization, and instructional technology that prevails among the vast majority of technical schools across the Nation. These institutions are doing an excellent job of training young men for productive employment in many technical fields, but the emphasis is on specific problem solving and analysis in very narrow areas.

This is precisely what must be avoided in preparing people for careers that require a broad environmental perspective.

Introducing change in a successful but specialized system is a difficult but necessary task. OE must be prepared to search out and consider a number of alternative paths for developing this critical manpower.

Initial Activity Areas for Manpower Planning and Vocational Education

OE is producing a five-year plan of action that can be used in making decisions concerning national manpower requirements for the three major branches of environmental management--pollution control, resource conservation, and health services. The first part of the five-year plan, particularly the rationale will be prepared by June 1, 1970 and will include a comprehensive assessment of existing manpower development activities in these three major branches of environmental management.

A second major activity will be the development of closer cooperation between OE and other agencies of HEW on matters of environmental management manpower program planning and between OE and other Departments of the Federal Government. This project has begun and a major progress report is due July 1, 1970.

A third activity concerns the second phase and more detailed planning required in the OE five-year plan for environmental management. The first cut at the five-year plan due on July 1, 1970, will establish a structure, time frame, and general and specific objectives. The second phase document will include additional data, analysis and refinement. It will also provide a frame of reference for examining how technical education might be modified to be effective in training manpower for environmental management. This product will be completed by December 15, 1970.

Manpower Development in FY 1971

In close cooperation with the U.S. Department of Labor, the Office of Education will continue to support a variety of short term training projects (less than a year) at the State and local levels in occupational areas related to pollution control and resource conservation. High priority will continue to be given to environmental health occupations. All of these jointly administered HEW/Labor training projects reflect programs and activities carried out under the Manpower Development and Training Act (MDTA).

New Programs

As part of the Federal Government's effort to decentralize certain functions and programs to the regional level, OE in FY 1971 will initiate a series of special projects of Technical Assistance and Training for local educational leaders.

Programs Planned for FY 1971

An assessment of OE initiated activities in manpower development, manpower training, and vocational and technical education throughout FY 1970 indicates 22 program areas ranging from the development of curriculum in waste water technology to the retraining upgrading of 100,000 auto mechanics across the country in specific training projects designed to reduce hazardous engine emissions.

Research, evaluation and focusing a national spotlight on innovative and successful programs in the field of environmental manpower development will be emphasized by OE in FY 1971. The urgent need to meet current and expanding manpower needs in the environmental occupations will be achieved by more effective utilization of MDTA machinery in developing environmentally related occupations.

As part of this project, it is anticipated that not less than 10 Manpower Skill Centers (1 per HEW Region) will be identified and assisted to develop close working relationships with post secondary educational institutions judged to be highly responsive to the needs of the communities they serve. This close working relationship should produce a major innovation in both education and manpower development.

The strengths and experience of Manpower Skill Centers will extent a new influence on the formal academic community while the educational institutions will provide MDTA trainees with more attractive career options.

Vocational and Technical Education

Emphasis in vocational and technical education in FY 1971 will continue to reflect a steady and systematic build up of programs in the field of environmental management at the secondary school level. Research, curriculum development, and teacher training in environmental education will be stressed at Regional, State and local levels.

Special Innovations in Manpower Development and Vocational Education

Currently under consideration by the U.S. Department of Labor is a major proposal developed by the Office of Education with the support of the Secretary of HEW.

Project Synopsis:

An innovative interdepartmental solution to the national environmental problems is proposed through the linkage of the Labor Department, and the Office of Education. It will include specialized training techniques in on-the-job training integrated into an overall interrelated training system.

Through this cooperative project, chronic unemployment and underemployment will be reduced. A comprehensive training program capable of supplying critical support personnel for the rapidly expanding field of environmental management will be developed. This cooperative approach is also designed to provide to disadvantaged young adults unique access

to an emerging vocational field that should offer attractive and long-term employment.

In order to qualify for employment in this critical field, the following support services must be provided to the trainee: basic education (utilizating ecological principles, tools and concepts), pre-job counseling and vocational guidance activities, pre-vocational training, on-the-job training, job coaching, and other activities and services essential to maintain a high level of program enrollment, participation, and success.

An Innovative Response to a Persistent Problem

Inadequate response on the part of the established and traditional educational system has resulted in a high rate of attrition and subsequent unemployment which reaches a critical mass at approximately age 16 or in the tenth grade. (Unfortunately, post-secondary programs with vocational overtones do not commence until the thirteenth year, and even these few post-secondary programs frequently lack the relevance demanded by a rapidly changing labor market. Therefore, at least two compelling characteristics stem from the organization of existing post-secondary education, rendering this sytem unresponsive to the needs of special individuals and the opportunities of the job market.) A Comprehensive Training and Placement System in the Emerging Field of Environmental Management has been designed to fill this gap with respect to the job market through development of an interchangeable technician, trained to function in multiple occupational roles in a broad field of environmental management. The training and experience program will be so organized as to offer interchangeable job opportunities outside of the environmental area, thus increasing occupational mobility and career potential.

The potential client population commonly exhibits a lack of vocational and experiential basis which would permit access to both the training programs and the labor market. Phase I of the project proposes that selection of potential candidates for this new career stream be focused on candidates with an approximate tenth grade or equivalent ten-year general educational attainment. It is expected that the majority of the candidates will be recent secondary school dropouts in their late teens. However, the scope of the project is such that the entire priority population described above, on the basis of appropriate grade level educational attainment, would have access to this program.

The unique and innovative aspect of this proposal is that it provides access for the sixteen-year old to post-secondary occupational education. This access is provided by the development of a new bridge over which a potential dropout can pass directly into post-secondary education, through special programs of early admission into the local community college similar post-secondary schools.

The Philosophical Bases for this Project

The philosophy of such a system is rooted in the belief that preventive maintenance is a better investment of the Federal manpower dollar than remedial action. Therefore, early admission is aimed not only at relieving unemployment, but also at the long-range goal of career development in an emerging field of critical national importance. Special incentives must be coupled with early admission in order to develop the new motivations necessary for the full preparation of applicants recruited from the priority population. Such incentives must be psychologically competitive with non-career opportunities which applicants will recognize as realistic and attractive alternatives. These must have appropriate financial incentives coupled with career perceptions that earlier apprenticeship systems provided, including graduated wage rates and labor market mobility.

An additional attribute of this proposal is that it will provide a socially rewarding career opportunities to large numbers from disadvantaged populations. Increasing national recognition of the critical nature of environmental management will also enhance the self-image of those who will enter this important field of expanding employment opportunity. Because this is an emerging career field, it provides an almost unique opportunity for full development of innovative career ladders, unfettered by jurisdictional barriers found in the traditional crafts and other employment areas. When these new career ladders are coupled with the concept of job interchangeability, a multiple return on the original investment will be forthcoming; unemployment will be reduced, socially attractive and financially rewarding employment will be achieved by substantial numbers from traditionally disadvantaged groups and the project will introduce into the labor market a new occupational classification in tune with our modern post-industrial society.

No less important is a substantial pool of qualified support personnel which will be made available to meet the manpower needs required if the Nation is to improve the quality of the environment.

Tentative Bench Marks for Measuring Program Success

1. By September 1970 enroll 10,000 disadvantaged and unemployed young adults with a tenth grade education in a community college pre-admit program designed to develop environmental management manpower.

2. By September 1971 graduate 1,000 certificate-level environmental specialists.

3. By June 1972 graduate 1,000 associate degree environmental management technicians.

4. By June 1973 graduate second group (1,000) of certificate level environmental specialists.

5. By June 1973 graduate 1,500 from second class of associate degree environmental management technicians.

6. By June 1975 place on the job in the field of environmental management, a total of at least 10,000 persons, recruited from "priority populations" (see PL 90-576, Section 102) and the formerly unemployed, at the following career levels:

a) 2,500 in associate degree technican positions,

b) 3,000 in certificate level positions, and

c) 4,500 in various supportive positions that offer opportunities for advancement.

ENVIRONMENTAL EDUCATION
THROUGH THE
STATE EDUCATION AGENCY

by

Richard Kay
Science Consultant
Department of Education
Boise, Idaho

presented at
IDAHO STATE UNIVERSITY
Pocatello, Idaho

OUR PROBLEM

Western man, through his unexpressed philosophy of solipsism, wherein man, the only real being of value, possesses absolute control, has created an ethic that places him above the laws of nature. Man's attitudes, values, and behavior are attuned to the exploitation of the earth as though there are no consequences. This philosophy and these values must be changed if man is to survive. The magnitude of the task cannot be overstated. It is not simply a matter of understanding. No degree of scientific literacy nor application of the human mind to technological/ecological progress will solve the problem.

Environmental education attempts to change attitudes and personal values. Its objectives are primarily affective and seek the development of a personal and a national environmental ethic. Instruction is inter-disciplinary, having its conceptual base in the science of ecology. But being a problem of economics and the social sciences, it transcends all other artificial discipline boundaries. Human attitudes, values, and ethics are basic to the education program with the goals being primarily affective. The skills of inquiry and process of science must remain the major pedagocial techniques by which these affective objectives are achieved. The facts of environmental education arise in ecological principles, but science cannot mold man's social nature in a direction that will give an understanding of man's role in relationship to the earth on which he depends. The social, technological and educational problems which have become imperatives through the activities of an extractionist, affluent and prolific naked ape will be solved only if every segment of the society is directed to action on a broad based effective educational program.

The economy or ethic which has brought us to this point of absolute committal for environmental education is based on a spiraling affluence which demands more affluence. This creates pressure for more and more use of our natural resources. The numerous resource management agencies, federal state and local must either yield to this pressure or by educational and public information programs convince us of our folly. These reactionary efforts have attempted to sell "after the fact" the activities of the respective agencies

Many excellent programs have been the result of these public information activities but the problem is more basic, more imperative and beyond the reach of these isolated efforts.

Colleges and universities which have taught conservation courses have been concerned only with the product of their academic departments. Forestry, wildlife, and range management colleges have looked with disdain on teacher training programs.

Preservation groups, beautification clubs, sports organizations, and many, many others have enlisted support, created programs and made demands on our environment and on our minds to further their own special interests.

Public school systems, being products of academic department oriented colleges, have not received an orientation that permits an interdisciplinary

approach to any subject. The methods, materials, even the need for environmental education has not been considered. Pressures in pure science, pure English, and pure mathematics and purer and purer training have led exactly in the opposite direction from those essential to environmental education. The financial bind that schools have had to face has not been conducive to anything except basic curricular offerings. The responsibility for environmental education has neither been assigned nor assumed within our system of public education. The concept of a total educational facility has been ignored. School grounds are blacktopped and concreted. Education has become something that takes place with a captive group, within four walls. The out-of-doors is used only for P.E., recess, and fire drills. The involvement of the community is for bond elections, Christmas programs, and individual disciplinary actions.

The combination of multidirectional, fragmented, and undefined responsibility in environmental education has lead in a full circle to a beginning again.

INTRODUCTION

Environmental education is mankind's key to survival. F. Fraser Darling wrote:

> . . . the strings of past philosophy trail round our feet, making us conservative from a sense of prudence rather than reason. Judaic monotheism put man and nature apart, an idea strengthened by Cartesian dualism of mind and matter. The older Dionysian intuition of wholeness was heresay, and the ancient Chinese comprehension of a universe of checks and balances and compensations, in which man was essentially a part and no more, was unknown and unscientific anyway. (7:299)

The tools to survival through environmental education revolve around changes in man's basic philosphy. The development of a national environmental ethic with changes in personal value systems through environmental education can only be achieved if certain key attributes of the program are present.

Environmental education must involve every segment of the population. Programs with children should start as early as possible and be relevant to the child's real world. The affective goals are best brought about through direct experience with the environment. Environmental education programs should be built upon the conceptual tool--ecology. Environmental education is interdisciplinary in subject matter content and must be sequentially developed yet remain evolutionary without becoming revolutionary.

We cannot discard the research, curriculum development, and teacher training programs of the 60's. The research in how children learn, the design of programs building upon skills of inquiry, the teaching techniques of inductive learning plus the experience of educators in innovation and administration have all led us into a position prepared for action.

Crash programs designed to effect change and consisting of men and money require direction and leadership. The Environmental Quality Education Act authorizing the Commissioner of Education to establish educational programs to encourage understanding of policies and support of activities designed to enhance environmental quality and maintain ecological balance can create this leadership. The National Advisory Committee on Environmental Education can give the necessary direction.

It has been pointed out that diverse programs among colleges, governmental agencies, isolated public school systems, private agencies, institutions or other organizations have had little effect and show little promise of achieving the desired goals. Pilot projects, curriculum reform, or teacher training programs must be conducted within a context of direction action.

All projects should be assigned one central state level educational agency. This agency should develop the necessary leadership to coordinate all programs within the state. Agencies that have been involved in conservation education should be led into a well coordinated and cooperative program. Although most states have already started the move to remove barriers to effective communication and dissemination of information, the key action words - leadership, cooperation, coordination, communication, and dissemination - remain a knotty interface between ideas and action.

STATE PLAN

The State Department of Education should serve as the central coordinating and administrative body for environmental education. A permanent staff to deal with environmental education should be appointed to work with an advisory committee appointed by the State Superintendent of Public Instruction and consisting of representatives from state and federal agencies with a strong interest in environmental education. This advisory committee may be served by a broader, more representative steering committee from various other statewide groups active in conservation.

The state educational agency should then develop a state plan in environmental education. This plan (1) should be designed to influence change through research and evaluation of existing programs and setting of optimum standards for implementing environmental education; (2) should include provisions for curriculum revision K-12 and the implementation plus development of new curricula which are interdisciplinary in nature and based on local educational needs; and (3) should include provisions for teacher training, both pre- and in-service. These teacher training programs should be designed to implement desirable environmental education curricula and provide trained professionals for work in colleges, universities, and resource management agencies.

The state plan should also provide for the development and operation of state environmental education sites with facilities for resident activities plus day camps and make provisions for the development of school sites suitable for environmental education including strong provisions for community involvement.

IMPLEMENTATION

The key to an effective environmental education program is strong leadership at the state level. This leadership should consist of a staff of environmental education specialists and the necessary secretarial help.

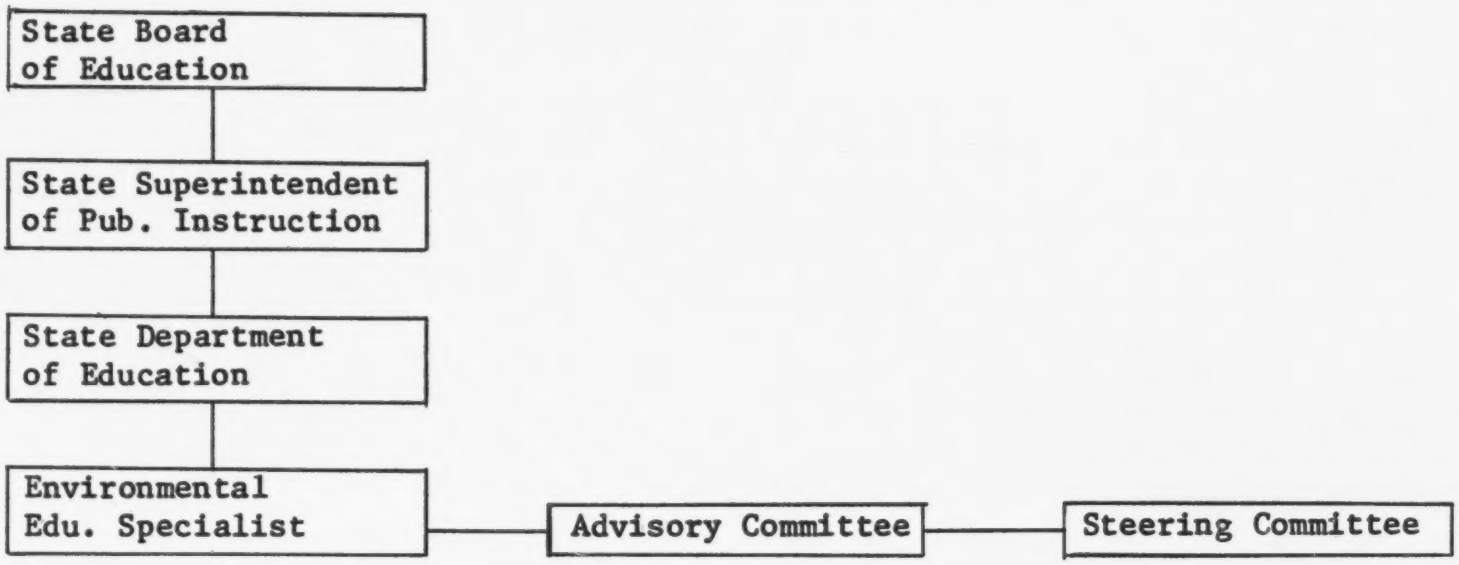
The advisory committee on environmental education should be a small group of intensely interested individuals from the most active state and federal resource management groups plus educational organizations within the state. A representative group might consist of representatives from the State Fish and Game Department, Department of Health, Land and Water Departments, Higher Education, and public schools. Federal agencies such as the USFS, SCS, and BLM should be involved. It may be desirable to appoint a steering committee more broadly representative but less directly involved than the advisory committee. This steering committee might consist of representatives from business, industry, agriculture, civic groups, sportsmen groups, political action groups, etc.

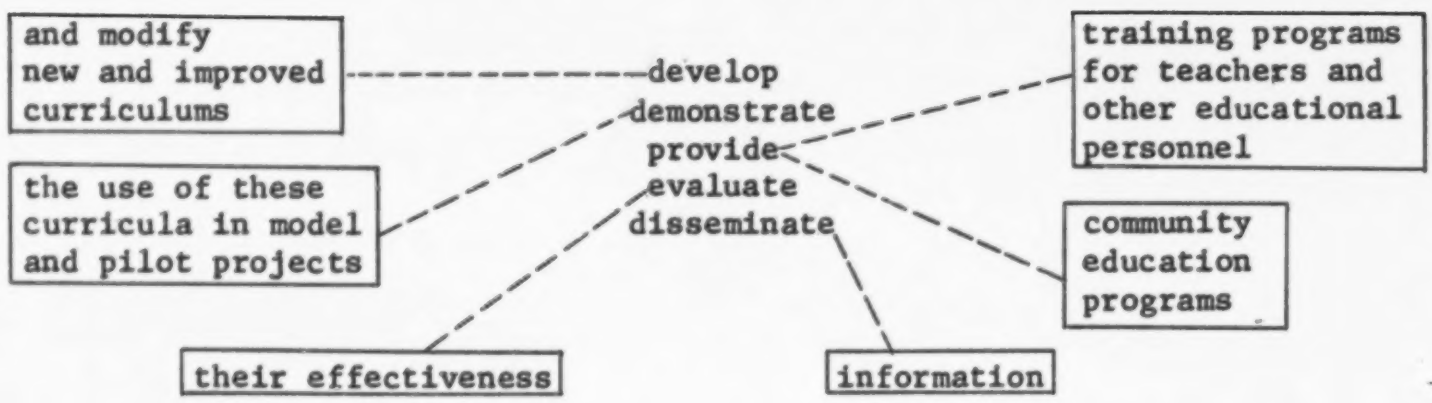
The state plan developed by the State Department of Education which is designed to influence change should include provisions for an inter-disciplinary curriculum revision K-12. Existing curricula in environmental education should be reviewed, modified for use at the local level, and implemented. If such curricula do not exist the state plan should include provisions for development of suitable curricula. These curricula should have carefully designed goals and be continously evaluated, field tested, and revised as the need dictates.

A comprehensive teacher training program should be implemented for both pre-service and in-service training of teachers. Changes in institutions of higher learning should also make provisions for the training of professional environmental education specialists including college level individuals and resource management agency environmental education specialists.

Each state should include plans for the development of outdoor education sites to be used both as resident camps, community action centers, and day camps. A model for the establishment of resident camps might be patterned after the outdoor education project for southwestern Idaho, a Title III NDEA project originally administered by the American Falls school district, but currently administered by the Snake River Center as a model for the nation by the Task Force on the Environment. The state plan should also include provisions for the development and use of existing school facilities as environmental education sites.

ORGANIZATIONAL CHART





A STRATEGY FOR CURRICULUM DEVELOPMENT AND IMPLEMENTATION IN ENVIRONMENTAL EDUCATION AT THE ELEMENTARY AND SECONDARY LEVEL BASED ON ENVIRONMENTAL ENCOUNTERS

by William B. Stapp*

Environmental Education in the School Curriculum:

Today's youth in elementary and secondary schools will soon be assuming important roles as adult citizens in society. As citizens and voters, no matter what their occupation may be, they will be asked to make decisions that will affect not only the immediate environment in which they live, but also that of their country. To an increasing extent the votes they will cast and the choices they will make will be concerned with their environment. They will be asked to make social and economic decisions about recreation, transportation, beautification, water needs, and air and water pollution control. Since these issues affect the total environment in which we live, we must assist our young people (and adults) to acquire the experiences, knowledge, and concern necessary for making informed environmental decisions.

In our political system we depend upon the wisdom of individuals of the populace for making decisions. A major responsibility for assisting future citizens to obtain the knowledge and incentive necessary to make informed decisions has been delegated to school systems. Since environmental education is essential to our type of political system, it is important for the public to ask if school systems are effectively fulfilling their responsibility to society.

---

*Dr. William B. Stapp is Professor, Resource Planning and Conservation, School of Natural Resources, University of Michigan, Ann Arbor, Michigan.

Dr. Arthur D. Barfield, Director of the Conservation Material Center, University of Massachusetts, recently made the following statement:

> Despite noticeable efforts on the part of communities and states to develop wholesome environmental attitudes and habits, it is common knowledge that much remains to be done in this direction. While radio, television, and various printed materials provide information pertaining to the wise use of our environment, we cannot rely upon or expect these media to accomplish the ultimate objective--the development of life long environmental understandings by the American public. It remains, then, that an approach is needed which will not only guarantee the dissemination of accurate information, but the installation of desirable attitudes and understanding of environmental education as well. Some experience has demonstrated that we must teach with these objectives in mind and not leave their realization merely to chance, it goes without saying that the schools offer the most natural and logical setting for meeting this end.
>
> Ironically, our educational institutions now play, at best a minor role in the environmental education movement. Traditionally, some schools have attempted to integrate environmental education into the existing curriculum while others have made progress through offering environmental education courses *per se*. Whatever the approach, available evidence suggests the need for greater emphasis upon this phase of the child's education.

One of the most important challenges of education today is to develop an effective method of implementing environmental education into elementary and secondary school systems.

A Strategy of Curriculum Development:

If individuals are to be prepared to make the kind of environmental decisions that our nation will face in the future, schools must embark on a comprehensive environmental education program that will span the curriculum, kindergarten through the twelfth grade, and link subject areas that relate most closely to the environment.

The information that follows, reflects the author's eight years of experience in serving as conservation consultant with the Ann Arbor Public

School System; a graduate seminar[1] in environmental education, School of Natural Resources. The University of Michigan; and a comprehensive review of the literature.

A School system (K-12), that is interested in developing an environmental education program might consider the following strategy:

Phase I: Identify the need for developing the program (page 4)

Phase II: Establish an environmental education committee to develop and implement the program and to facilitate communication (page 6)

Phase III: Establish the goal and sub-goals of the program (page 7)

Phase IV: Establish the objectives (in terms of behavioral predispositions) of the program (page 11).

Phase V: Review of the literature regarding theories of learning and instruction that apply to the formulation and implementation of the program (page 12)

Phase VI: Establish the curriculum organization of the program (page 13)

Phase VII: Establish the curriculum of the program (page 15).

Phase VIII: Establish a comprehensive in-service teacher education program (page 23)

Phase IX: Develop instruments to evaluate the effectiveness of the program (page 24)

---

(1) The members of the seminar were: Donald Austin, Marion Baker, William Bryan, Ellen Jackson, Katherine Lien, Jean MacGregor, Paul Nowak, Cynthia Russell, Sara Segal, James Swan, and Professor William Stapp.

Phase I: The Need for Developing an Environmental Education Program.

Within the past fifty years, the United States has become a predominantly urban nation, both in thought and in physical character. Large and middle-sized communities, many within complex urban regions, have evolved to where over seventy percent of this country's population resides on one and one-half percent of the nation's land surface. By 1980, eight out of ten Americans will probably live in an urban environment. Consequently, the independent rural-oriented living that once characterized this country's social and political heritage is no longer a dominating influence in the lives of most Americans.

In rural surroundings, direct daily contact with the basic natural resources was prevalent, especially within man's immediate environment. As man became progressively urbanized, his intimate association and interaction with natural resources diminished and, with it his awareness of his dependency on them. Yet, it is imperative that man, wherever he lives, comprehend that his welfare is dependent upon the "proper" management and use of these resources.

Man should also have an awareness and understanding of his community and its associated problems. Our communities are being plagued with problems such as lack of comprehensive environmental planning, indiscriminate use of pesticides; community blight; air and water pollution; traffic congestion; and the lack of institutional arrangements needed to cope effectively with environmental problems. While these problems are legitimate concerns of community governmental officials and planners, the responsibility for their solution rests, to a large extent, with citizens.

To an increasing extent citizens are being asked to make decisions

that affect (directly and indirectly) their environment. Specifically, citizens make these decisions as they cast votes on community issues; as they elect representatives to policy-making bodies; as they directly act upon the environment itself. Citizens can be effective in influencing sound policy in other ways. They can ask informed questions, at the proper time, of the right people. They can serve on advisory and policy-making committees. They can support sound legislation directed at resolving environmental problems. To perform these tasks effectively, it is vital that the citizenry be knowledgeable concerning their biophysical environment and associated problems, aware of how they can help solve these problems, and motivated to work toward effective solutions.

The Supreme Court decision regarding the one-man, one-vote concept, that has enabled the increasing urban majority to acquire greater powers in decision-making, makes it imperative that programs developed for urbanites be designed with them in mind. It is important to assist each individual, whether urbanite or ruralite, to obtain a fuller understanding of the environment, problems that confront it, the interrelationship between the community and surrounding land, and opportunities for the individual to be effective in working toward the solution of environmental problems.

Most current programs in conservation education are oriented primarily to basic resources; they do not focus on the community environment and its associated problems. Furthermore, few programs emphasize the role of the citizen in working, both individually and collectively, toward the solution of problems that affect our well being. There is a vital need for an educational approach that effectively educates man regarding his relationship

to the total environment.[1]

Phase II: Establish an Environmental Education Committee to Develop and Implement the Program and to Facilitate Communication.

An essential component of most successful school programs is effective communication between the community and school system.

The introduction of any new school program requires the involvement and preparation of the community, administration, teaching staff, and student. One reason many well-conceived programs have failed is because teachers and students were not involved in program development.

In developing an environmental education program, it is important that an environmental education committee[2] be formed to develop and implement the program and to facilitate communication between the community and the school system. The committee should consist of elementary teachers (representing each grade level), secondary teachers (representing each discipline), school administrators, community citizens, and students. The environmental education committee should report to the superintendent of schools (or to an individual or committee designated by the superintendent).

In developing an environmental education program for a school system, it is strongly recommended that an environmental education consultant position be created. The environmental education consultant could provide the leadership and guidance essential to the success of any program. One

---

(1) Stapp, William B., et al. "The Concept of Environmental Education", The Journal of Environmental Education. Vol. I, No. I, 1969, pp. 30-31

(2) It should be recognized that part of the responsibility for developing and implementing an environmental education program might be assigned to an existing instructional committee.

of the major responsibilities of the environmental education consultant would be to assist in the development and implementation of the in-service teacher education program.

Some important duties of the environmental education committee would be to:

...Assist in the development of the philosphy and structure of the program.

...Become familiar with existing instructional material relevant to environmental education.

...Identify community resources, both physical and human, to serve the program.

...Assist in the development and distribution of instructional material (such as environmental encounters).

...Provide a comprehensive in-service teacher education program.

...Train community citizens to serve the program.

...Assist in the development of school sites to serve the program.

...Administer the program.

...Make presentations to parent-teacher and other community organizations regarding the program.

...Evaluate the effectiveness of the program in achieving stated objectives.

Phase III: Establish the Goals[1] and Sub-Goals of the Environmental Education Program.

Without a clear statement of goals, an environmental education program would become a series of unrelated experiences, focusing perhaps on limited program objectives.

The goal[2] of environmental education is to produce a citizenry that

---

(1) The local environmental education committee might consider the goals and sub-goals expressed below.

(2) Stapp, William B., et al. "The concept of Environmental Education". Journal of Environmental Education Vol. I, No. 1, 1969, pp. 30-31

is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution.

The major sub-goals[1] of environmental education are to help individuals acquire:

1. A clear understanding that man is an inseparable part of a system, consisting of man, culture, and the biophysical environment, and that man has the ability to alter the interrelationships of this system.

   The principal feature of the philosophy of environmental education is that man is an integral part of a system from which he cannot be separated. Specifically, this system consists of three components, man, culture, and the biophysical environment. Culture, in this context, incorporates organizational strategies, technological processes, and social arrangements (political, legal managerial, educational, etc.) through which man interacts with the biophysical environment. The biophysical environment designates both the natural and man-made components of the environment.

   The fundamental relationship between the integral parts of the system is man's interaction through culture on the biophysical environment to produce or obtain the goods and services that he needs.

   Within the system, man has the ability to either strengthen,

---

[1] Stapp, William B., et al. "The Concept of Environmental Education". Journal of Environmental Education. Vol. I, No. 1, 1969, pp. 30-31

weaken, or maintain the interrelationships between the system's major components. A major thrust of environmental education is the development and maintenance of a high quality system in which man interacts through culture on the biophysical environment to advance human welfare.

2. A broad understanding of the biophysical environment, both natural and man-made, and its role in contemporary society.

The existence of any civilization is dependent upon man's use of natural resources. Resources are defined as those parts of the biophysical environment which are appraised by man as being immediately or potentially useful to him.

A basic understanding of natural resources ideally includes their characteristics, distribution, status, interrelationships, and their present and potential uses. Natural resources serve man in many ways, whether in a relatively undisturbed condition or in the highly altered utilitarian forms of the man-made biophysical environment. A strong understanding of how these resources are used requires knowledge of the social, political, economic, technological processes, institutional arrangements, and aesthetic considerations which govern their utilization.

Man's use of natural resources comprises the man-made component of the biophysical environment. An understanding of this aspect is also essential: it should ideally include familiarity with urban and rural design, including transportation systems, spatial patterns of development, and aesthetic qualities which have a major impact on the functioning of society. Fundamental to these

understandings should be the realization that the development of the man-made environment should strive for a high quality system which improves human welfare in relation to the natural environment

3. A fundamental understanding of the biophysical environmental problems confronting man, how to help solve these problems, and the responsibility of citizens and government to work toward their solution.

   Biophysical environmental problems result from the interactions between man, culture and the biophysical environment. Pollution, the inefficient utilization and management of natural resources, the indiscriminate use of pesticides, urban blight, and transportation congestion are just a few biophysical environmental problems. These problems caused by a complex set of biological, physical and social factors, affect the total environmental system.

   Citizens need to understand how to work toward solutions of biophysical environmental problems through laws, public policies, planning, resource management, research, technological developments, and institutional arrangements.

   Citizens should realize that the responsibility for solutions to these problems belongs to them and the governments which represent them.

4. Attitudes of concern for the quality of the biophysical environment which will motivate citizens to participate in biophysical environmental problem-solving.

   The word "attitude" used in this context implies more than simply the knowledge of a body of factual information. Instead, it implies a combination of factual knowledge and motivating emotional

concern which result in a tendency to act. Further, it is understood that clusters of attitudes about similar environmental conditions will collectively produce values which will motivate individuals to express their attitudes. Therefore, for environmental education to achieve its greatest impact, it must: 1) provide factual information which will lead to an understanding of the total biophysical environment; 2) develop a concern for environmental quality which will motivate citizens to work toward solutions to biophysical environmental problems; and 3) inform citizens as to how they can play an effective role in achieving the goals derived from their attitudes.

Phase IV: Establish the Objectives (1) (in terms of behavioral predispositions) for an Environmental Education Program

There are various ways to state the expected and desired outcomes of an environmental education program. Perhaps the most significant and dynamic approach is to state them in terms of behavioral predispositions. In other words, the product of an environmental education program (K-12) should be a citizen who is:

1. Interested in his environment and its relationship to society.
2. Sensitive (total awareness) to his environment, both natural and man-made aspects of it.
3. Sensitive to the dimension of quality of his environment and able to recognize environmental problems.
4. Inclined to participate in coping with environmental problems

---

(1) The local environmental education committee might consider the objectives expressed below.

Phase V: Review of the Literature Regarding Theories of Learning[1] and Instruction that Apply to the formulation and Implementation of of an Environmental Education Program.

A recent review of the literature reveals the following points that should be considered in the formulation of an environmental education program:

...Behaviors which are reinforced are most likely to recur. It is important that desired behaviors be reinforced by the home, school, church, youth organizations, etc.

...The most effective effort is put forth by youth when they try tasks which fall in the "range of challenge"--not too easy and not too hard--where success seems likely but not certain.

...Youth are more likely to throw themselves wholeheartedly into any project if they themselves have a meaningful role in the selection and planning of the enterprise.

...Reaction to excessive direction of the teacher is likely to be: apathetic conformity; defiance; escape from the whole affair.

...What is learned is most likely to be available for use if it is learned in a situation much like that in which it is to be used and immediately preceding the time when it is needed. Learning in youth, then forgetting, and then relearning when need arises is not an efficient procedure.

...The learning process in school ought to involve dynamic methods of inquiry.

...Research shows little correlation between cognitive achievement and

---

[1] The local environmental education committee might consider the theories of learning and instruction expressed below (these are not unique to environmental education).

concern and values. Able students who achieve well in traditional "content-centered courses" do not necessarily demonstrate commitment to positive social goals.

...Learning takes place through the active behavior of the student. It is what he does that he learns, not what the teacher does. The essential means of an education are the experiences provided, not the things to which the student is merely exposed.

...One of the keys to motivation is a sense of excitement about discovering for one's self, rather than having a generalization presented by a a teacher and requiring a student to prove it.

...Attitudes may not be formed through a rational process by which facts are gathered and a reasonable conclusion drawn, but rather through the repeated exposure to ideas.

...Helping citizens to acquire technical knowledge alone regarding an environmental problem, may not increase their concern for the problem.

...Citizens are more likely to become involved in environmental issues if they are aware of how they can have some effect upon decision-making.

Phase VI: Establish the Curriculum Organization[1] of the Environmental Education Program

An important criticism of our public school system is the lack of adequate articulation between the various divisions of the school organization. Instead of a well developed series of instructional units and activities commencing at the kindergarten level and terminating at the 12th grade, many school systems present a series of units that have little relationship between

---

[1] The local environmental education committee might consider thoughts on curriculum organization expressed below.

what has previously been taught and what will be taught in future years. The K-12 approach seems to be the most sound way to plan a curriculum for environmental education.

It is also important to plan curriculum projects horizontally as well as vertically. Disciplines, such as science and social studies, should not be studied in isolation. A curriculum should be planned so that students can see the contributions of interdisciplinary studies in assisting the learner to better understand the environment and to be more effective in solving environmental problems.

Furthermore, a curriculum program should recognize individual differences. There is no sequence that will meet the needs of all groups of youth. Therefore, a curriculum program should be flexible in design so that material can be presented in different ways depending on the background, needs, and aspirationsof the students.

A set of guiding principles that should be considered when structuring an environmental education program are:

...Span the curriculum, kindergarten through the twelfth grade, so that environmental experiences can be presented at every grade level, thereby capitalizing on the cumulative effects of the program.

...Link subject areas that relate most closely to the environment, especially science and social studies, so that both the social and scientific knowledge important in understanding and solving environmental problems are properly developed.

...Integrate and correlate the program with the existing curriculum in a manner that will enhance the instructional goals of the school system.

...Focus on the local environment, but do not neglect regional, national, and international environmental issues.

...Stress attitudes and problem solving skills. The most important environmental impact that most of our urban citizens will have upon our environment is through their action as community citizens.

...The learner should play an active role in the learning process. The learner develops attitudes through personal experiences and thinking and not through the presentation of predigested conclusions.

...Provide a comprehensive in-service teacher education program which would operate throughout the school year and directed at assisting teachers to increase their understandings, interest, awareness, and teaching skills in environmental affairs and to involve them in curriculum development.

Phase VII: Establish the Curriculum (1) of the Environmental Education Program.

In establishing an environmental education program for a school system (K-12), consideration should be given to the development of a series of environmental encounters. The encounters should focus the attention of elementary and secondary youth on their environment and in a manner that would link relevant ecological, economic, social, technological, and political information.

The environmental encounters could be designed to provide the learner with meaningful environmental experiences at each grade level, both elementary and secondary. The encounters could be used to enhance and extend an existing instructional program or to serve as the core of a comprehensive environmental education program.

---

(1) The local environmental education committee might consider environmental encounters as an integral part of their program

Environmental encounters would provide the flexibility that a program needs to meet varying local environmental conditions and situations, as well as individual class needs.

Some examples of topics that the environmental encounters might focus upon, are: land resources, water resources, air resources, plant resources, animal resources, environmental design, environmental planning, transportation, solid waste disposal, and recreation. The class could select with the teacher environmental encounters to extend an existing class unit or to serve as the central thrust of a major teaching unit.

In developing environmental encounters, the following guidelines are recommended:

...At each grade level the learner should be exposed to <u>meaningful</u> environmental encounters that relate relevant ecological, economic, political, technological, and social information. However, greater emphasis in the earlier grades should be toward developing in youth an interest, awareness, understanding and respect for the environment, and in the latter years emphasis should be on "honing" problem solving skills.

...Environmental encounters should provide the opportunity at each grade level for the learner to become personally involved in positive action toward the solution of environmental problems in which he has been exposed.

...The learner should play a major role in both selecting and designing environmental encounters.

...Environmental encounters should fall in the range of challenge--not too easy and not too hard.

...Environmental encounters should involve dynamic methods of inquiry.

...Environmental encounters that relate to environmental problems, should expose the learner to the following problem solving procedure:

1. Define the environmental problem or issue
2. Become informed about the problem
3. State the alternative solutions
4. Develop a plan of action
5. Implement the plan of action

Every environmental encounter should contain a list of the outcomes that are desired. The outcomes desired should be expressed as behavioral objectives. They (behavioral objectives) provide: direction for the learning process; guidance in selecting content and experiences; greater focus on the learner--what the learner does; and the opportunity to appraise (evaluate) the effectiveness of a particular learning
1 experience and of the total program. Behavioral objectives can be stated at different levels of complexity and in the cognitive (knowledge), affective (concern), and action domains.

An example of an environmetal encounter recommended for a 6th grade class, is as follows:

INVESTIGATING A POND COMMUNITY

"An Environmental Encounter for a 6th Grade Class"

Behavioral Objectives:

In the completion of a successful encounter, the student should be able to:

1. Draw an accurate map of the drainage area of the pond community.

2. Describe in writing four ways that the land in the drainage areas affects the pond community.
3. Draw two (2) food chains illustrating organisms observed in the pond community.
4. List (number) major problems affecting the pond community.
5. Describe in writing the major steps in solving one (1) of the problems noted in question #4.

Activity:

1. What is the bottom of the pond community like: How does the type of bottom affect the kinds of plants and animals found in the pond community?
2. As you look from the center of the pond community toward the shore, are there plants growing under water, on the surface, and out of the water? Why are plants important to the pond community?
3. Dip a small jar into the pond and note if there are small organisms (these are probably plankton organisms). Why is plankton important to the pond community? What would cause plankton to increase or decrease?
4. Make or obtain a dip net and sample around the edgeof the pond community. How are the animals you have caught important to the pond community? Draw a food chain linking some of the plants and animals you have noted in and around the pond community.
5. On a map of your community color in the land area that drains toward the pond. How has the use of this land changed over

the past 15 years? What changes are occurring at the present time? How does the use of this land affect the pond community?

6. Do both children and adults visit the pond community? What do people do when they visit the pond community?
7. Do you see any problems that are affecting the pond community? Who is responsible for creating the problems? What could your class do to help solve one of the problems noted above (define the problem, become informed about the problem, state alternative solutions, develop a plan of action, implement the plan)? Is your class motivated and concerned about <u>one</u> of the problems to the degree that they desire to work toward its solution?

An example of an environmental encounter recommended for a high school <u>American Government</u> class, is as follows:

FLOOD PLAIN ZONING

"An Environmental Encounter for an American Government Class"

<u>Behavioral Objectives</u>:

In the completion of a successful encounter, the student should be able to:

1. Draw on a map of his community the flood plains (50 year flood line) of the <u>(name)</u> River from <u>(location)</u> to <u>(location)</u> and record accurately how each flood plain is developed.
2. Describe in writing the number of floods and flood damage that has occurred on the flood plains of the <u>(name)</u> River from <u>(location)</u> to <u>(location)</u> over the past 60 years (or over the time that records have been filed).

3. Describe in writing the major provisions in the laws of his state and community regarding flood plain zoning.
4. Identify the power structure (pressure groups, governmental committees, governmental policy makers) of his community regarding who influences and makes policy on flood plain development and zoning.

Activities:

1. Take a tour (or illustrate by slides) along the (name) River from (location) to (location) and note the following:
   a. Are there a series of flood plains?
   b. How are the flood plains developed?
   c. Are there homes or buildings on the flood plain? Are they flood proofed?
   d. Are there provisions for protecting the flood plains from flooding?
   e. What trends regarding land development are occurring on the flood plains of your community?
2. Seek information from reliable sources regarding the flood plains of the (name) River from (location) to (location):
   a. Has flooding of the flood plains occurred during the past 60 years?
   b. List the years in which flooding has occurred.
   c. Approximately how much damage (dollars, lives, inconveniences) has occurred on the flood plains as a result of flooding over the past 60 years?

d. What does your state flood plain ordinance say? If none exists, is it considering an ordinance?

e. What does your community flood plain ordinance say? If none exists, is it considering such an ordinance?

f. How is the undeveloped land on the flood plain zoned?

g. Are there any current proposals to utilize the undeveloped flood plains of your river for recreational, residential, commercial, or industrial development?

h. What proposals seem wise or unwise in light of the hazards you have identified?

3. Draw on a map of your community the flood plains (50 year flood line) of the (name) River from (location) to (location) and record how each flood plain is developed.

4. Determine by interviews the points of view of land developers, community citizens, realtors, chamber of commerce officials, planning commission members, city council members and students of your class regarding the future development of of the flood plains of the (name) River from (location) to (location).

5. Based on the information collected, have the class formulate alternative solutions to the development (or preservation) of the flood plains on the (name) River from (location) to (location).

6. Draw a chart of the power structure (pressure groups, governmental committees, governmental policy makers) of your community regarding who influences (underline the influencers) and makes policy (circle the policy makers) on flood plain development and zoning.

7. If the solution advocated by the class members is different from the point of view held by the planning commission and policy makers of your community, then develop and implement a plan of action (presentation to the appropriate authority, develop a fact sheet, publicize your position, etc.).

Each environmental encounter should also provide data regarding sources of additional information relevant to the topic.

If the environmental educational program for a school system revolved around environmentalencounters, a twelfth grader may not be exposed to all aspects of the environment. However, through the inductive (inquiry) approach advocated by this system, a twelfth grader that had been exposed to this program should be more sensitive (total awareness) to his environment, better able to recognize environmental problems, a more sophisticated development of problem solving skills essential to the solution of emerging environmental problems, and more inclined to participate in coping with environmental problems than the product of other forms of instruction known to the author. The learner would also have an understanding and should see the importance of relating ecological, economic, social, technological, and political information when working toward the solution of environmental problems.

The environmental encounters should be produced by the local environmental education committee and by youth and teachers from throughout the school system. The environmental encounters produced at the local level could be mimeographed and distributed to all schools in the system. Many school systems might need and desire consultant help (which is available) to orient the local environmental education committee to the task of developing environmental encounters. However, samples of environmental encounters

could be developed and produced by a national publishing house according to elementary grade levels (lower elementary, middle elementary, upper elementary) and secondary subject matters (general science, American Government, biology, economics, social problems, etc). Environmental encounters produced at the national level could be adapted to meet local needs and situations by the local environmental education committee.

Phase VIII: Establish a Comprehensive In-Service Teacher Education Program (1)

If our youth are to acquire the interest, awareness, understandings, and skills essential in understanding and contributing to the solution of environmental problems, then it is imperative that our schools provide environmental learning experiences. However, few teachers are prepared in our colleges and universities to use the environment to enrich instructional goals. For this reason a comprehensive in-service teacher education program is essential to a successful environmental education program (K-12)

An effective in-service teacher education program should be developed by the local environmental education committee. An early task would be to formulate a comprehensive in-service teacher education plan, which might include the following:

a. Clear statement of objectives

b. Time sequence regarding when offerings will occur throughout the school year.

c. Involvement of teachers at all grade levels and subject areas.

d. Development of written material and instructional aids to assist

---

(1) The local environmental education committee might consider the guidelines for developing a comprehensive environmental education program expressed below.

the teacher in understanding and presenting environmental information.

e. Blending of community environmental experiences with indoor presentations.

f. Provisions for experiences to occur on school sites.

g. Promotion and publicity of local collegiate offerings and scholarship programs.

The first stage of an in-service teacher training program would be to orient all teachers and administrators to the philosophy of environmental education, structure of the environmental education program, and ways to effectively utilize environmental encounters.

The second stage of an in-service teacher training program would be to plan a bus tour of the community to provide teachers with first hand experiences regarding their local environment and associated problems. Information should be provided to all teachers regarding community citizens and governmental officials knowledgeable on the environment and available to serve the school system as resource persons on environmental matters.

The third stage of the in-service teacher training program would be to assist the teachers in ways to effectively integrate environmental encounters into the school program.

Phase IX: Develop Instruments to Evaluate the Effectiveness of the Environmental Education Program.

It is imperative that instruments be developed to evaluate the extent to which behavioral objectives are attained and the effectiveness of the total environmental education program. An evaluation should be a continuous process involving pupil and teacher feedback.

It is imperative that the evaluative instruments be objective, reliable, and valid. It should be noted that behavioral objectives provide an excellent opportunity to appraise the effectiveness of particular learning experiences and of the total program.

The evaluative instrument could be developed by the local environmental education committee.

Summary

If we are to bring urbanized man to a fuller understanding of his environment, our schools must embark on a comprehensive environmental education program. The program should be aimed at helping our youth to be more knowledgeable concerning the environment and associated problems, aware of how to help solve these problems, and motivated to work toward their solution.

One of the most important challenges of education today is to develop an effective method of implementing environmental education into our elementary and secondary school systems.

This paper provides one strategy as to how a school system might develop a comprehensive environmental education program (K-12). The environmental encounters could be used to enhance and extend existing class units or to serve as the core of a comprehensive environmental education program.

BIBLIOGRAPHY

Atkin, Myron. "Behavioral Objectives in Curriculum Design: A Cautionary Note". Science Teacher. Vol. 35, May 1968. pp. 27-30

Beauchamp. George. Curriculum Theory. 1965

Bennett, Dean. Organization and Operation of the Yarmouth Maine Environmental Education Program. Yarmouth Public Schools. 1969 pp. 1-9

Bruner, Jerome S. The Process of Education. Vintage Books, 1960

Bruner, Jerome. Toward a Process of Instruction. Norton and Co.

Bryan, William. " A Conceptual Plan for an Environmental Education Program". Unpublished Master's Thesis. University of Michigan, 1967

Cohen, Arthur R. Attitude Change and Social Influence. Basic Books. 1964

Dewey, John. Experience and Education. Collier Books

Hess, Robert. "Political Attitudes in Children". Psychology Today. Vol. 2, No. 8. January 1969. pp. 24-28.

Hess, Robert and Judith Torney. The Development of Political Attitudes in Children. Aldine. 1967.

Kretch, Critchfield, and Ballachey. Individuals in Society. 1962.

Kelley, Earl. Education for What is Real. 1947

Kelley, Earl. "The Place of Affective Learning". Educational Leadership. Vol. 22. April 1965. pp. 455-457.

Lane, Robert E. and Sears, David. Public Opinion. Prentice Hall. 1964.

Miller, H. and H. Smiley. Education in the Metropolis. The Free Press

Montague, Earl and David P. Butts. "Behavioral Objectives". Science Teacher. Vol. 35, March 1968

Montague Earl and John J. Koran, Jr. "Behavioral Objectives and Instructional Design: An Elaboration". Science Teacher. Vol. 35, March 1969.

Neagley, Ross, and Dean Evans. Handbook for Effective Curriculum Development. 1967.

Ojemann, Ralph. "Should Educational Objectives be Stated in Behavioral Terms?" The Elementary School Journal. Vol. 68, February 1968.

Piaget, Jean and Inhelder, Barbel. The Psychology of the Child. Basic Books. 1969.

BIBLIOGRAPHY

Atkin, Myron. "Behavioral Objectives in Curriculum Design: A Cautionary Note". Science Teacher. Vol. 35, May 1968. pp. 27-30

Beauchamp. George. Curriculum Theory. 1965

Bennett, Dean. Organization and Operation of the Yarmouth Maine Environmental Education Program. Yarmouth Public Schools. 1969 pp. 1-9

Bruner, Jerome S. The Process of Education. Vintage Books, 1960

Bruner, Jerome. Toward a Process of Instruction. Norton and Co.

Bryan, William. " A Conceptual Plan for an Environmental Education Program". Unpublished Master's Thesis. University of Michigan, 1967

Cohen, Arthur R. Attitude Change and Social Influence. Basic Books. 1964

Dewey, John. Experience and Education. Collier Books

Hess, Robert. "Political Attitudes in Children". Psychology Today. Vol. 2, No. 8. January 1969. pp. 24-28.

Hess, Robert and Judith Torney. The Development of Political Attitudes in Children. Aldine. 1967.

Kretch, Critchfield, and Ballachey. Individuals in Society. 1962.

Kelley, Earl. Education for What is Real. 1947

Kelley, Earl. "The Place of Affective Learning". Educational Leadership. Vol. 22. April 1965. pp. 455-457.

Lane, Robert E. and Sears, David. Public Opinion. Prentice Hall. 1964.

Miller, H. and H. Smiley. Education in the Metropolis. The Free Press

Montague, Earl and David P. Butts. "Behavioral Objectives". Science Teacher. Vol. 35, March 1968

Montague Earl and John J. Koran, Jr. "Behavioral Objectives and Instructional Design: An Elaboration". Science Teacher. Vol. 35, March 1969.

Neagley, Ross, and Dean Evans. Handbook for Effective Curriculum Development. 1967.

Ojemann, Ralph. "Should Educational Objectives be Stated in Behavioral Terms?" The Elementary School Journal. Vol. 68, February 1968.

Piaget, Jean and Inhelder, Barbel. The Psychology of the Child. Basic Books. 1969.

Rokeach, Milton. Beliefs, Attitudes, and Values. Jossez-Bass. 1968.

Science Research Associates. Youth Power. 1968

Stapp, William B., et al. "The Concept of Environmental Education". The Journal of Environmental Education. Vol. I, No. 1. 1969, pp. 30-31

Stapp, William B. Integrating Conservation and Outdoor Education into the Curriculum (K-12).

Swan, James. "Response to Air Pollution: A Study of Attitudes and Coping Strategies of High School Youth". Journal of Environment and Behavior. 1970.

Swan, James. "The Challenge of Environmental Education". Phi Delta Kappa September 1969. pp. 26-28

Taba, Hilda. Curriculum Development. Harcourt, Brace, and World. 1962.

Tyler, Ralph. Basic Principals of Curriculum and Instruction. 1950.

Vaiozey, John. Education in the Modern World. World University Library. Toronto. 1967.

White, Gilbert. "Formation and Role of Public Attitudes". Environmental Quality in a Growing Economy. John Hopkins Press. 1966. pp. 105-127.